

NASA's Orbital Debris Optical and IR Ground-based Observing Program Utilizing the MCAT, UKIRT, and Magellan Telescopes

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Characterizing debris in Earth-orbit has become increasingly important as the population growth rises steadily, posing greater and greater threats to active satellites with each passing year. Currently, the Joint Space Operations is tracking over 23,000 pieces of debris, ranging in size from 1-meter and larger in geosynchronous orbits (GEO) to 10-cm and larger at low-Earth orbits (LEO). Model estimates suggest that there may be more than 500,000 pieces of spacecraft debris larger than 1 cm currently in orbit around the Earth. With such a small fraction of the total population being tracked, and new break-ups occurring in LEO, GEO, and Geo Transfer Orbits, new assets, techniques, and approaches for characterizing this debris are needed.

With this in mind, NASA's Orbital Debris Program Office has actively tasked a suite of telescopes around the world. In 2015, the newly-built 1.3m optical Meter Class Autonomous Telescope (MCAT) came on-line on Ascension Island in the South Atlantic Ocean and is currently in its commissioning phase. MCAT is designed to track Earth-orbiting objects above 200km, conduct surveys at GEO, and work in tandem with a newly-installed Raven-class commercial-off-the-shelf system, a 0.4-meter telescope co-located on Ascension with a field-of-view similar to MCAT's and research-grade instrumentation designed to complement MCAT for observations taken either simultaneously or in tandem.

The 3.8m infrared UKIRT telescope on Mauna Kea, Hawaii, has been heavily tasked throughout 2015 and into 2016, collecting data on individual targets as well as in survey modes to study both the general GEO population as well as an individual break-up event of a BRIZ-M Rocket body that occurred in January 2016. Data collected include photometry and spectroscopy in the near-Infrared (0.85 – 2.5 μm) and the mid-infrared (8-16 μm).

Finally, the 6.5-m Baade Magellan telescope at Las Campanas Observatory in Chile was used to collect optical photometric survey data in October 2015 of two GEO Titan breakups, focusing on locations of possible debris concentrations as indicated by the NASA standard break-up model.

A summary of the status and results of these programs will be presented.